

UNITED STATES PATENT APPLICATION

of

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for

**SYSTEM AND METHOD FOR TUNING CHANNELS
USING A CENTRAL POINT OF CONTROL**

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NOTED - 9/27/2000

BACKGROUND OF THE INVENTION

1. Related Application

This application is a divisional of U.S. Patent Application Serial No. 09/244,222, filed February 4, 1999, entitled "System and Method of Interconnecting and Using Components of Home Entertainment System," which is a continuation-in-part of U.S. Patent Application Serial No. 09/154,609, filed September 16, 1998, and entitled "System for Enhanced Entertainment System Control." Both of the foregoing patent applications are incorporated herein by reference.

2. The Field of the Invention

The present invention relates to tuning channels in a home entertainment system. More specifically, the present invention is directed to systems and methods for tuning a channel using a central point of control in a home entertainment system that includes an interconnection of a television set or another display device and various consumer electronics devices such as VCRs, stereo systems, video disk players, satellite receivers, cable boxes, video game players, and Internet terminal devices.

2. The Prior State of the Art

The television has been a source of entertainment for individuals since its introduction and traditionally has been a fairly simple device for users to set up and connect. A user simply unboxed the television, connected the antenna, plugged in the power cord and turned on the television. Once on, a user could control the functions of the television by adjusting dials or buttons on the television or sending information to the television via a remote control.

1 Since the inception of television, other consumer electronics devices that may be
2 connected to a television have been introduced. For instance, VCRs, video disk players, and
3 video game devices provide enhanced entertainment. Cable television services and satellite
4 receivers along with traditional broadcast antennas provide reception of video programming.
5 Home theater systems provide surround sound and near theater quality audio. Internet
6 terminals, such as WebTV boxes developed by WebTV Networks, Inc., of Mountain View,
7 California, allow consumers to connect to the Internet and to send and receive information,
8 using a television as the display device. Using the foregoing electronic consumer devices or
9 others in combination with a television, consumers can now select and configure a wide
10 variety of home entertainment systems.

11 Although many consumer electronics devices now exist, connecting, continuing, and
12 managing multiple devices in order to realize the full benefit of each component of a home
13 entertainment can be extremely difficult and frustrating. It can be a difficult task for a user
14 of a home entertainment system to determine how to interconnect the multiple electronic
15 consumer devices of the entertainment system such that each is appropriately connected to
16 the television. The difficulty increases as more devices are connected to the television. And
17 even when properly configured and interconnected, the performance of each device suffers
18 when the television is connected to multiple devices. Thus, while diverse types of consumer
19 electronics devices are increasingly available for inclusion into a home entertainment
20 system, the overall result is often one of confusion, suboptimal performance, or a less than
21 ideal user experience.

22 The conventional method for connecting devices in a home entertainment system is
23 the "daisy chain" method. To illustrate the conventional daisy chain method and the
24 magnitude of its limitations, reference will now be made to Figures 1-3, which depict an

1 increasing level of complexity as consumer electronics devices are added to a home
2 entertainment system. Figure 1 illustrates a basic configuration that enables a user to access
3 television without any scrambled channels and to access the Internet. A television antenna
4 jack 14 is connected to an Internet terminal 12, which can be a special-purpose computer
5 system that enables Internet access and permits a user to browse and retrieve information
6 from the Internet to the television screen. One such Internet terminal is the previously-
7 mentioned WebTV box. Internet terminal 12 is in turn connected to a television 10. Both
8 Internet terminal 12 and television 10 are connected to an A/C power jack 18. Internet
9 terminal 12 is also connected to a telephone jack 20. A remote control 16 enables the user to
10 provide input to the Internet terminal 12. In this basic configuration, the user experience is
11 generally relatively high. The greatest potential source of confusion is introduced by the
12 many ways to connect the television 10. The user typically has to match the television
13 output of Internet terminal 12 with the corresponding channel, such as channel 2, 3 or 4, of
14 television 10. In addition, depending on the television programming signal available and the
15 nature of the components of the home entertainment system, the connection between
16 Internet terminal 12 and television 10 may be established by coaxial cable, RCA cables, or
17 S-video cables. Once the appropriate connections are established, the home entertainment
18 system of Figure 1 operates on a relatively intuitive and understandable way.

19 As one more device is introduced into the home entertainment system, the user
20 experience is often significantly diminished. If one or more of the channels are scrambled
21 or if the cable feed is digital, the home entertainment system must include a cable box, as
22 illustrated in Figure 2. The cable television jack 24 is connected to a conventional cable box
23 22, which is connected to Internet terminal 12, which is connected in turn to television 10.
24 Internet terminal 12 and television 10 are also connected to the an A/C power jack 18, while

1 Internet terminal 12 is further connected to a telephone jack 20. In order to allow a user to
2 change channels and control the various devices by remote control 16, Internet terminal 12
3 may incorporate a mechanism that prevents the user from having to use a separate remote
4 control for each consumer electronics device and enables components of the home
5 entertainment system to be controlled even if they are not in the line of sight of remote
6 control device 16. For example, Internet terminal 12 can have an associated IR blaster (an
7 infrared emitter) 26 for relaying remote control signals from Internet terminal 12 to one or
8 more other consumer electronics devices. In the example of Figure 2, the user can change
9 channels on cable box 22 by transmitting the appropriate signal from remote control device
10 16 to Internet terminal 12. Internet terminal 12 then relays the signal to cable box 22 using
11 IR blaster 26.

12 The interdevice connection required for the cable television and Internet access
13 illustrated in Figure 2 introduces several problems and limitations. This configuration
14 requires not only the television 10 be tuned to the appropriate input channel, but also
15 Internet terminal 12 be properly tuned. The difficulty of connecting the devices of Figure 2
16 is compounded by the fact that television 10 and the Internet terminal 12 may need to be
17 tuned to different channels. Therefore, when Internet terminal 12 is turned off and the cable
18 box signal is "passed through" to television 10, an unexpected television channel from cable
19 box 22 may appear on the television.

20 Despite its usefulness, IR blaster 26 further complicates the task of configuring the
21 home entertainment system. In particular, the user must position IR blaster 26 so that IR
22 receiver 28, located on the cable box 22, can receive the signal from the IR blaster. This
23 sometimes requires significant trial and error. Further, signals from remote control 16
24

1 sometimes interfere with the signals emitted from IR blaster 26, causing an undesired
2 response from cable box 22.

3 Adding yet another consumer electronics device to the home entertainment system
4 has been associated with an unacceptable level of complexity for many users who practice
5 conventional interconnection techniques. In one example, Figure 3 illustrates a conventional
6 configuration 8 that includes a VCR. The daisy chain includes cable television jack 24,
7 cable box 22, VCR 30, Internet terminal 12, and television 10. Internet terminal 12,
8 television 10, and VCR 30 receive power by being each connected to A/C power jack 18 via
9 adapter 32. Internet terminal 12 is also connected to a telephone jack 20, an IR blaster 26 for
10 relaying remote control signals to IR receiver 28 on cable box 22, and another IR blaster 34
11 for relaying remote control signals to IR receiver 36 on VCR 30. The difficulty of
12 understanding how to connect and operate the home entertainment system of Figure 2 is
13 exacerbated by the addition of VCR 30 of Figure 3.

14 In this configuration, VCR 30, Internet terminal 12, and television 10 each needs to
15 be tuned to channel 2, 3, or 4. The user can experience confusion as different channels
16 appear on television 10, depending on which devices are on or off. Additionally, VCRs
17 generally have a function which allows the user to either pass through the RF from the cable
18 box 22 or use the internal tuner of the VCR. Thus, it can be difficult for Internet terminal 12
19 to determine whether an incoming signal is transmitted from cable box 22 or from the tuner
20 within VCR 30. The user of the home entertainment system of Figure 3 must program
21 Internet terminal 12 to control cable box 22 and VCR 30, as well as program remote control
22 16 to control television 10. There is also the possibility that signals from remote control 16
23 could interfere with those emitted from IR blaster 26 and IR blaster 34. The specific order
24 of devices in the daisy chain of Figure 3 limits how the devices can interoperate. For

1 instance, VCR 30 can record the output of cable box 22, but not the output of Internet
2 terminal 12. Certain imaginative uses of VCR 30 cannot be practiced because of the
3 specific daisy chain configuration required in the system of Figure 3, in which some video
4 output, such as that generated by Internet terminal 12, is not received by the VCR.

5 It can be understood that the home entertainment system configurations of Figures
6 1-3 represent only a small number of the many configurations that are possible. Many
7 multiple-device systems that do not include an Internet terminal likewise suffer from
8 complex interconnection configurations that limit their use by consumers and otherwise
9 prevent multiple consumer electronics devices from being advantageously used in
10 combination. The basic problems illustrated in Figures 1-3 can be expected to deepen as
11 new consumer electronics devices are developed and marketed.

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007240-96T.45560

SUMMARY AND OBJECTS OF THE INVENTION

The present invention relates to systems and methods for tuning channels within a home entertainment system by connecting consumer electronics devices to a central device that has an internal tuner and is capable of processing, routing, or otherwise responding to any signal. The invention further extends to the central device, which is capable of interconnecting the consumer electronics devices in a hub and spoke configuration so that all signals pass through the central device. Home entertainment systems configured according to the invention are flexible, offer improved interoperability of components, and are easily set up, expanded, and maintained compared to those configured according to conventional techniques.

In one implementation of the invention, multiple consumer electronics devices are connected to a central device. The central device has multiple, identical and interchangeable jacks that can receive cables connected to the consumer electronics devices. Because the interchangeable jacks are identical, the user does not need to understand specific connection requirements for the various consumer electronics devices. Instead, the user must merely remember that an appropriate cable must be connected between input or output ports on the consumer electronics device and to any desired jack on the central electronics device. Connecting components of a home entertainment system in this manner is significantly less complicated than the daisy chain configuration of the prior art.

Because the central device is interposed between any two consumer electronics devices in the hub and spoke configuration, any signals transmitted in the home entertainment system must pass through the central electronics device. The central electronics device can then process, route, or otherwise respond to the signals in novel ways. For instance, an electronic program guide (EPG) indicates which signals are scrambled and

1 which are non-scrambled. The central electronics device tunes the non-scrambled signals
2 and routes the scrambled signals to an electronics device, such as a cable box, for
3 descrambling. This method of tuning non-scrambled signals takes advantage of an internal
4 tuner of the central electronic device that may be significantly faster in tuning a channel than
5 a tuner used in the traditional method.

6 The identical, interchangeable jacks of the invention are compatible with cables that
7 transmit S-video signals or RCA video signals. Accordingly, when a user connects a
8 television set or another consumer electronics device to the central electronics device, the
9 user does not need to understand the difference between S-video and RCA connections. The
10 user merely needs to know enough to identify the appropriate cable and connect it to the
11 television set and one of the identical jacks. Moreover, the user does not need to understand
12 how video signals are passed from a cable jack to a cable box and to the television and,
13 optionally, through a VCR. Instead, the hub and spoke configuration requires the user only
14 to understand that each device should be connected to the central electronics device.

15 The invention also extends to central electronics devices having the features that
16 allow them to be used in the hub and spoke configurations disclosed herein. The central
17 electronics devices contain hardware and computer-executable instructions for sensing
18 which cable is connected to each of the identical jacks and for formatting or responding to
19 signals passing through the jacks.

20 Additional objects and advantages of the invention will be set forth in the description
21 which follows, and in part will be obvious from the description, or may be learned by the
22 practice of the invention. The objects and advantages of the invention may be realized and
23 obtained by means of the instruments and combinations particularly pointed out in the
24 appended claims. These and other objects and features of the present invention will become

1 more fully apparent from the following description and appended claims, or may be learned
2 by the practice of the invention as set forth hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the manner in which the above-recited and other advantages and objects of the invention are obtained, a pore particular description of the invention briefly described above will be rendered by reference to specific embodiments thereof which are illustrated in the appended drawings. Understanding that these drawings depict only typical embodiments of the invention and are not therefore to be considered limiting of its scope, the invention will be described and explained with additional specificity and detail through the use of the accompanying drawings in which:

Figure 1 is a schematic diagram illustrating a conventional configuration for a home entertainment system in which an Internet terminal is connected to a television.

Figure 2 is a schematic diagram illustrating the home entertainment system of Figure 1 with the addition of a cable box, wherein the components are connected one with another in a daisy chain configuration.

Figure 3 is a schematic diagram depicting the home entertainment system of Figure 2 with the addition of a VCR.

Figure 4 is an elevation view of a back panel of a central electronics device according to one embodiment of the invention, illustrating a plurality of identical, interchangeable jacks.

Figure 5 is a schematic diagram illustrating the components of a central electronics device that provide Internet access.

Figure 6 is a schematic diagram depicting a basic hub and spoke configuration of a home entertainment system.

Figure 7A is a schematic diagram showing the home entertainment system of Figure 3 having been configured according to the hub and spoke configuration of the invention.

1 Figure 7B is a schematic diagram illustrating the home entertainment system of
2 Figure 7A having an IR emitter and an IR repeater.

3 Figure 8 is a schematic diagram illustrating multiple consumer electronics devices
4 connected to a central electronics device in a hub and spoke configuration.

5 Figure 9 is a schematic diagram depicting the components of a central electronics
6 device that can be used to insert electronic programming guide information in a recording of
7 video programming on a video recording medium.

8 Figure 10 illustrates one example of programs recorded on the recording medium of
9 Figure 9.

10 Figure 11 is a schematic diagram illustrating components of the central electronics
11 device for sensing the cable type connected thereto and formatting electrical signals
12 accordingly.

13 Figures 12A and 12B depict a cable that is compatible with both S-video and RCA
14 video signals.

15 Figure 13 show other cables that can be connected to the identical, interchangeable
16 jacks of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention relates to systems and methods for interconnecting consumer electronics devices in a home entertainment system, wherein multiple electronics devices are directly connected to a central device in a hub and spoke configuration. The invention further extends to the central device that is capable of interconnecting the consumer electronics devices in the hub and spoke configuration, of routing signals and of tuning channels. Home entertainment systems configured according to the invention are flexible, offer improved interoperability of components, and are easily set up, expanded, and maintained compared to those configured according to conventional techniques.

The invention is described below by using diagrams to illustrate either the structure or processing of embodiments used to implement the system and method of the present invention. Using the diagrams in this manner to present the invention should not be construed as limiting of its scope. The embodiments of the present invention may comprise a special purpose or general purpose computer including various computer-executable instructions or computer hardware, as discussed in greater detail below.

The invention will be described below in reference to consumer electronics devices included in a home entertainment or information retrieval system. In this context, "consumer electronics device" or "electronics device" is used to refer to any number or type of various consumer electronics devices that provide audio output, video output, or information services or can be connected to a television set. Such devices include, but are not limited to, cable boxes, satellite receivers, video cassette recorders (VCRs), video game consoles, video disk players, home theater equipment, home stereo equipment, Internet terminals, personal computers, and television sets. "Home entertainment system" refers to a system that includes one or more consumer electronics devices and provides audio and/or

1 video output to a user and is not limited to those that are used in residential buildings.
2 "Information retrieval system" refers to a system that includes one or more consumer
3 electronics devices and provides Internet or other information services to a user.

4 Certain embodiments within the scope of the present invention include computer-
5 readable media having computer-executable instructions or data fields stored thereon. Such
6 computer-readable media can be any available media which can be accessed by a general
7 purpose or special purpose computer. By way of example, and not limitation, such
8 computer readable media can comprise RAM, ROM, EEPROM, CD-ROM or other optical
9 disk storage, magnetic disk storage or other magnetic storage devices, or any other medium
10 which can be used to store the desired computer-executable instructions or data fields and
11 which can accessed by a general purpose or special purpose computer. Combinations of the
12 above should also be included within the scope of computer-readable media.

13 Computer-executable instructions comprise, for example, instructions and data
14 which cause a general purpose computer, special purpose computer, or special purpose
15 processing device to perform a certain function or group of functions. In some contexts, the
16 computer-executable instructions will be described as program modules being executed by a
17 computer or processor within a consumer electronics device. Generally, program modules
18 include routines, programs, objects, components, data structures, etc. that perform particular
19 tasks or implement particular abstract data. The computer-executable instructions,
20 associated data structures, and program modules represent examples of the program code
21 means for executing the steps of the methods disclosed herein.

Exemplary Computing Environment

Figures 4 and 5 illustrate an example of a central electronics device according to the invention. A "central electronics device" is any consumer electronics device that can function as a central device in a hub and spoke architecture of a home entertainment or information retrieval system as disclosed herein. In the embodiment of Figures 4 and 5, the central electronics device also functions as an Internet terminal. However, in other embodiments, the central electronics device can merely function as a central device in the hub and spoke architecture or can instead provide additional functions by being integrated in any other consumer electronics device.

Figure 4 illustrates the back panel of a central electronics device 40. Central electronics device 40 includes means for electrically connecting each of a plurality of electronics devices to the central electronics device in a hub and spoke configuration. Jacks 42 represent one example of such means. Each of the jacks 42 is an identical connector that can be used to connect any of the plurality of consumer electronics devices to the central electronics device. Unlike the separate audio, RCA cable, S-video, and other connectors typically found in conventional electronics devices, jacks 42 can be used to transmit or receive any of a variety of video, audio, or data signals from the consumer electronics devices. For instance, any particular jack 42 can function with stereo or mono audio signals, S-video signals, or RCA signals. This capability is described in greater detail below and enables central electronics device 40 to conveniently interconnect cable boxes, satellite receivers, video tape recorders, video game consoles, video disk players, home theater equipment, home stereo equipment, television sets, and other consumer electronics devices without the user having to understand the different cables and connection techniques that have been conventionally used in home entertainment systems. The number of jacks 42 can

1 be enough to provide input to or output from each of the other consumer electronics devices
2 included in the home entertainment system. While ten to twelve jacks 42 have are often
3 enough to support a reasonably complex home entertainment system, the number may be
4 greater or smaller depending on the number of other consumer electronics devices.

5 Central electronics device 40 further includes an AC power input 44, a phone jack 46
6 (to support the optional Internet access or other information services), and optionally a
7 universal serial bus (USB) port 48 and a digital terrestrial antenna 50. A coaxial cable input
8 52 receives cable television signals from a cable provider.

9 The features of central electronics device 40 that permit interconnection of the
10 consumer electronics devices included in a home entertainment system can be integrated
11 with the components of an Internet terminal as illustrated in Figure 5. For instance, central
12 electronics device 40 can include the Internet access and data processing components that
13 have been found in Internet terminals that use television sets as display devices. In one
14 example, central electronics device can be a WebTV box that has been modified to function
15 as a central device in a hub and spoke configuration.

16 Figure 5 illustrates components of central electronics device 40 that are used to
17 provide information retrieval services. Central electronics device 40 includes hardware and
18 computer-executable instructions for providing the user with a graphical user interface, by
19 which the user can access Internet resources, send and receive e-mail, and optionally receive
20 other information services. Operation of central electronics device 40 is controlled by a
21 central processing unit (CPU) 54, which is coupled to an application-specific integrated
22 circuit (ASIC) 56. CPU 54 executes computer-executable instructions designed to
23 implement features of central electronics device 40. ASIC 56 contains circuitry which is
24 used to implement certain functions of central electronics device 40. For example, ASIC 56

1 may be coupled to an audio digital-to-analog converter 58 and to a video encoder 60, which
2 provide audio and video output, respectively, to a television set included in the home
3 entertainment system.

4 Central electronics device 40 may further include an IR interface 62 for detecting
5 infrared signals transmitted by a remote control input device, such as a hand-held device or a
6 wireless keyboard. In response to the infrared signals, IR interface 62 provides
7 corresponding electrical signals to ASIC 56. IR interface is one example of means for
8 receiving input from a user. Other examples include one or more buttons on central
9 electronics device 40, an input device connected by a cable, or any other mechanism for
10 receiving input. A standard telephone modem 64 is coupled to ASIC 56 to provide
11 communication with a modem pool of an Internet service provider (ISP). In other
12 embodiments, modem 64 may be supplemented or replaced with an ISDN modem, a cable
13 modem or another suitable communications device.

14 Also coupled to ASIC 56 are a mask read-only memory (ROM) 66, a flash memory
15 68, and a random access memory (RAM) 70. Mask ROM 66 is non-programmable and
16 provides storage of computer-executable instructions and data structures. Flash memory 68
17 may be a conventional flash memory device that can be programmed and erased
18 electronically. Flash memory 68 may store Internet browser software as well as data
19 structures. In one embodiment, a mass storage device 72 coupled to ASIC 56 is included in
20 central electronics device 40. Mass storage device 72 may be used to supply computer-
21 executable instructions and data structures to other components of the central electronics
22 device or to receive data downloaded over the Internet or provided from other consumer
23 electronics devices in the home entertainment system. Mass storage device 72 may include
24

1 any suitable medium for storing computer-executable instructions, such as magnetic disks,
2 optical disks, and the like.

3 Application software and associated operating system software are stored in flash
4 memory 68, or instead may be stored in any other suitable memory device, such as mask
5 ROM 66 or mass storage device 72. The computer-executable instructions that, according to
6 one embodiment of the invention, are used to adapt video and audio signals to the particular
7 consumer electronics devices connected to the central electronics device 40 by means of
8 jacks 42 are executed by CPU 54. In particular, CPU 54 executes sequences of instructions
9 contained in one or more of mask ROM 66, flash memory 68, and RAM 70 to perform
10 certain steps of the present invention that will be more specifically disclosed hereinafter.

11 12 Hub and Spoke Configuration

13 Figure 6 illustrates one example of a hub and spoke configuration of a home
14 entertainment system according to the invention. Central electronics device 40 represents
15 the hub of the hub and spoke configuration. Cable box 122, VCR 130, television set 110,
16 and consumer electronics devices 106 and 108 are represented as being connected to central
17 electronics device 40 by one of the spokes of the hub and spoke configuration. Likewise,
18 cable jack 124 can be described as being connected by a spoke to central electronics device
19 40.

20 The hub and spoke configuration of Figure 6 contrasts with the daisy chain
21 configuration illustrated in the prior art systems of Figures 1-3. In the hub and spoke
22 configuration, any video, audio, or data signals transmitted between cable box 122, VCR
23 130, television set 110, consumer electronics devices 106 and 108, and cable jack 124 must
24 pass through central electronics device 40. In the daisy chain configuration, signals pass

1 through some or all of the components of the home entertainment system, depending on the
2 position of the transmitting and receiving components in the daisy chain. For instance, in
3 Figure 3, signals transmitted from Internet terminal 12 to television 10 do not pass through
4 VCR 30, nor is there any mechanism for routing the signals to VCR 30.

5 A home entertainment system configured according to the hub and spoke
6 configuration of Figure 6 can have as few as two components (e.g., central electronics
7 device 40 and television 110) or as many components as can be attached to the jacks of the
8 central electronics device. As the number of components increases to three, four, or more,
9 the advantages of the hub and spoke configuration compared to the daisy chain
10 configuration of Figures 1-3 become more pronounced.

11 The hub and spoke configuration of Figure 6 has several advantages that are not
12 present in the daisy chain configuration. For example, all signals pass through, are received
13 by, or are transmitted by central electronics device 40. Accordingly, central electronics
14 device 40 can control, manage, process, reformat, route, or otherwise respond to any signal
15 transmitted, generated, or received by any of the devices connected to the central electronics
16 device. In the daisy chain configuration of Figures 1-3 there is no single device that has
17 access to all signals of the home entertainment system. Providing central access to all
18 signals in the home entertainment system enables the signals to be processed in novel ways.
19 For example, any video or audio signal transmitted in the home entertainment system of
20 Figure 6, regardless of its source or destination, can be transmitted to VCR 130 and recorded
21 thereat. Other novel methods of processing and routing signals by central electronics device
22 40 may be understood by those skilled in the art upon learning of the disclosure made
23 herein, and are likewise encompassed by the invention.

1 Another advantage of the hub and spoke configuration of Figure 6 is that if one or
2 more of the consumer electronics devices connected to central electronics device 40 fail, the
3 remaining components of the home entertainment system can continue to function. For
4 example, if VCR 130 is disabled, cable television programming can continue to be displayed
5 on television 110. In particular, cable television signals can be passed directly from cable
6 jack 124, through central electronics device 40, to television 110, bypassing a disabled VCR
7 130. In contrast, if VCR 30 of Figure 3 is disabled, cable television signals are prevented
8 from passing from cable box 22 to television 10. In order to continue viewing cable
9 television programming on television 10, the user must manually reconfigure the home
10 entertainment system of Figure 3 by bypassing VCR 30. This basic limitation of the daisy
11 chain configuration is overcome by the hub and spoke configuration of the invention.

12 The hub and spoke configuration of the invention also greatly simplifies the process
13 of connecting the components of a home entertainment system, maintaining the connections,
14 and adding new consumer electronics devices. If a user adds a new consumer electronics
15 device, the user must merely connect the new device to one of the identical jacks 42 of
16 Figure 4. For example, if consumer electronics device 106 of Figure 6 is a new video game
17 console to be included in the home entertainment system, the user must only remember how
18 to perform the basic task of connecting a new consumer electronics device to central
19 electronics device 40. Moreover, the task of connecting a new consumer electronics device
20 to central electronics device 40 is basically the same, regardless of whether the new
21 consumer electronics device is a video game console, stereo equipment, digital versatile disk
22 players (DVDs) or the like. Thus, the user generally does not need to know any special
23 requirements for connecting the video game console. Furthermore, the existing devices,
24

1 such as cable box 122 and VCR 130 of Figure 6 do not need to be repositioned,
2 reconfigured, or removed from the home entertainment system 100.

3 In contrast to the ease of connecting and upgrading home entertainment system 100,
4 adding new consumer electronics devices to a conventional daisy chain system, such as that
5 illustrated in Figure 3, may be much more difficult. For example, it is very likely that a user
6 will have great difficulty connecting a new video game console to home entertainment
7 system 8. It is not clear where the video game console could be inserted into system 8.
8 Many users would resort to completely disconnecting all components of system 8 from
9 television 10 and replacing them with the video game console each time video games are to
10 be played. In some conventional configurations, this is the only available approach.

11 Yet another advantageous feature of the hub and spoke configuration is that it
12 permits cable box 122 to tune scrambled television channels while central electronics device
13 40 tunes non-scrambled channels. In this embodiment, central electronics device 40 stores a
14 copy of an electronic programming guide (EPG) that indicates which channels are
15 scrambled and which are not. Scrambled channels are routed to cable box 122, where they
16 are descrambled and returned to central electronics device 40. Non-scrambled channels, as
17 designated in the EPG, are not routed to cable box 122, but are instead tuned in central
18 electronics device 40. Tuning non-scrambled channels in central electronics device 40 takes
19 advantage of the tuner in device 40 that may be significantly faster than the tuner in cable
20 box 122. This method of tuning non-scrambled channels in central electronics device 40 is
21 possible because all signals are accessible by device 40, which can reroute the signals to
22 cable box 122, if desired.

23 Figure 7A illustrates a hub and spoke configuration of the invention that corresponds
24 to the daisy chain configuration of Figure 3. In Figure 7A, cable jack 124 is connected to

1 coaxial cable input 52, thereby providing cable video signals to home entertainment system
2 200. AC input 44 receives electrical power, while phone jack 46 provides communication
3 with an ISP. A remote control device 116 enables a user to provide infrared signals to
4 central electronics device 40 to control any desired function of home entertainment system
5 200.

6 Television set 110 is connected to jack 42a of central electronics device 40 by means
7 of an appropriate cable that transmits S-video or RCA signals, depending on the type of the
8 television set. As will be further described below, jack 42a and the other jacks 42 are
9 compatible with S-video or RCA signals. Accordingly, the user selects the appropriate cable
10 154 based on the type of television set 110, connects one end of the cable to the television
11 set and the other end to any desired jack 42 (e.g., jack 42a).

12 Cable box 122 is similarly connected to central electronics device 40. The user
13 selects the appropriate cables that match the video input and output ports of cable box 122,
14 and connects the cables to the cable box and any desired jacks 42 (e.g., jacks 42c and 42d).
15 Likewise, VCR 130 is connected to jacks 42e and 42f. It is noted that the user does not need
16 to remember any special connection techniques when configuring home entertainment
17 system 200, but must merely remember that the video input and output ports of television set
18 110, cable box 122, and VCR 130 are to be connected to any desired jack 42 using an
19 appropriate cable.

20 As shown in Figure 7A, an IR blaster assembly 156, having any desired number of
21 IR blaster emitters (e.g., emitters 126 and 134), can be connected to one of jacks 42. In this
22 example, the user has connected IR blaster assembly 156 to jack 42b and placed emitter 126
23 near cable box 122 and emitter 134 near VCR 130. As the user enters IR signals using
24

1 remote control device 116, the signals are relayed to cable box 122 or VCR 130 in a format
2 supported by the particular consumer electronics device that is to be controlled.

3 Alternatively, as shown in Figure 7B, the IR blaster assembly is replaced by a single
4 IR emitter 170 included within the housing of central electronics device 40. In this case, the
5 single IR emitter 170 floods the room with IR energy that typically reaches the other
6 consumer electronics devices directly or by reflection. If the room in which the home
7 entertainment system is located does not have enough reflectivity to control the other
8 devices with single IR emitter 170, an IR repeater 172 can be positioned within the room in
9 the line of sight of single IR emitter 170 so as to relay the IR signals to the other consumer
10 electronics devices.

11 Home entertainment system 200, configured in a hub and spoke architecture,
12 provides the advantages discussed above, including ease of connecting components and
13 upgrading the system, central access to signals, and continued use of the system in the event
14 of failure of one or more components.

15 Figure 8 shows a home entertainment system including a larger number of consumer
16 electronics devices. Home entertainment system 300 includes central electronics device 40
17 connected to cable jack 124. Like system 200 of Figure 7, system 300 of Figure 8 includes
18 television set 110, cable box 122, and VCR 130 connected to central electronics device 40.
19 It should be noted that the foregoing consumer electronics devices have been connected to
20 different jacks 42 in Figure 7 and Figure 8, thereby illustrating that jacks 42 are
21 interchangeable, and the user generally does not need to remember any special connection
22 techniques for the various consumer electronics devices other than connecting them to any
23 desired jack 42.

1 System 300 further includes a digital satellite system receiver 160, a DVD player
2 162, a video game console 164, and stereo equipment 166, each connected to one of jacks
3 42. A further advantage of the central electronics device 40 and the hub and spoke
4 configuration is that they can be used with currently existing consumer electronics devices,
5 such as those illustrated in Figure 8, as well as other consumer electronics devices that may
6 be available in the future.

8 Video Recording Capabilities

9 The invention extends to enhanced video recording methods that are enabled by
10 central electronics device 40 and the hub and spoke configuration of the invention. Because
11 all signals of the home entertainment systems configured according to the invention can be
12 accessed and rerouted by central electronics device 40, a video recording system included in
13 the home entertainment system can be used to record video signals in novel ways.

14 As noted in reference to Figure 5, one embodiment of the central electronics devices
15 of the invention can access and store information retrieved from the Internet or other
16 information sources. For instance, as shown in Figure 9, central electronics device 240
17 includes an EPG store 220 for storing an electronic programming guide that includes video
18 programming information relating to television programming available to be viewed or
19 recorded with the home entertainment system. Electronic programming guides are known in
20 the art, and often include the program start time, duration, title, description, ratings, and
21 other information relating to a television program. Central electronics device 240 receives
22 an EPG from an EPG source 222, which may be an Internet site accessible by device 240, a
23 digital satellite service, a cable service provider, or any other source.

1 Central electronics device also includes recording instructions 224 provided by a
2 user of the system to instruct a VCR control module 226 how to control operation of VCR
3 230. Recording instructions may comprise instructions stored on a computer-readable
4 medium in central electronics device 240. In this case, the instructions may be stored when
5 a user programs central electronics device 240 in order to cause VCR 230 to record a
6 selected program at some later time. Alternatively, recording instructions 224 may comprise
7 real-time signals input to central electronics device 240 to cause VCR to operate without
8 delay. The user can use remote control device 216 to input recording instructions 224 or
9 may instead use another input device associated with the home entertainment system.

10 Assume that recording instructions 224 include instructions to cause VCR to record a
11 selected video programming at 3:00 p.m. According to one embodiment of the methods for
12 recording video programming, at a time just before 3:00 p.m., central electronics device 240
13 causes programming information included in EPG store 220 to be recorded at a selected
14 portion of recording medium 232. For example, VCR control module 226 can receive the
15 title and description of the video programming, or any other EPG programming information,
16 from EPG store 220. The programming information is then transmitted to VCR 230, where
17 it is recorded at the selected portion of recording medium 232. Thus, VCR control module
18 226 and EPG store 220 represent examples of means for transmitting programming
19 information stored in the EPG and the VCR. The programming information can be used to
20 create a title page for the video programming.

21 At 3:00, VCR control module 226 transmits the video signal that is received from
22 video source 234 to VCR 230. The video signal, which contains the selected video
23 programming, is recorded on recording medium 232. In the vertical blanking interval (VBI)
24 or the overscan area of the video signal, central electronics device 240 can insert the name of

1 the video programming and the frame number. After recording, VCR control module 226
2 causes VCR 230 to rewind (or forward) recording medium 232 to a specified location. EPG
3 programming information is then recorded in the VBI or overscan area of recording medium
4 232 at the specified location and becomes, in effect, indexing information describing the
5 video programming recorded on the recording medium.

6 Figure 10 represents recording medium 232, which may be a segment of video tape,
7 with programs A, B, and C recorded thereon. Programs A, B, and C have been recorded on
8 recording medium according to a recording method of the invention, one embodiment of
9 which has been described above in reference to Figure 9. Indexing information 238 has
10 been recorded on the VBI or overscan area of a specified location 242 of recording medium
11 232. Indexing information includes entries 238a, 238b, and 238c, corresponding to
12 programs A, B, and C, respectively. In this example, indexing information references the
13 location of recording medium 232 at which the beginning of the corresponding programs are
14 recorded. For instance, entry 238a references location 244a, entry 238b references location
15 244b, and entry 238c references location 244c. Additionally, entries 238a-c can include the
16 program title, description, duration, and/or any other EPG programming information.

17 Recording medium 232 of Figure 10 can be used to describe several of an essentially
18 unlimited number of indexing techniques that can be used to record, view, and manage the
19 contents of the recording medium. For example, in one embodiment of the invention, the
20 system of Figure 9 automatically determines whether recording medium 232 has enough
21 free space 246 to record a program D as instructed by the user of the system. In particular,
22 VCR control module 226 can read indexing information 238 to determine the size of free
23 space 246. If programming information associated with program D stored at EPG store 220
24 indicates that free space 246 is large enough to record program D, recording medium 232 is

1 used to record program D at the specified time. If, however, free space 246 is not large
2 enough, the user is prompted to insert another recording medium into VCR 230.

3 Thus, the invention can automatically track the amount of free space 246 available
4 on recording medium 232. The user does not need to manually tabulate the size of free
5 space 246 or to make unreliable estimates. As a result, the system of Figure 9 can reliably
6 ensure that a video program will be recorded on the recording medium without losing the
7 tail end of the program. In contrast, losing the tail end of a recorded video program when
8 the recording medium is filled has been frequently experienced by users of conventional
9 home entertainment systems.

10 Moreover, users do not need to manually advance a video cassette to the beginning
11 of the free space when using the invention. Instead, the indexing information 238 of Figure
12 10 identifies start 248 location of free space 246. Thus, when a user desires to record
13 program D, VCR control module 226 can record an entry in indexing information 238
14 corresponding to program D and then forward (or rewind) recording medium 232 to the start
15 location 248 of free space 246.

16 Indexing information 238 can enhance the experience of viewing video
17 programming recorded on recording medium 232. For example, indexing information 238
18 can be displayed to the user by means of television set 210, thereby informing the user of the
19 contents of recording medium 232. Again, the user is relieved of the task of manually
20 tabulating the contents of recording medium 232. As indexing information 238 is displayed
21 to the user, the user can learn of the title, description, and other information relating to the
22 video programming, which typically includes information that is not likely to have been
23 manually tabulated according to conventional techniques.

1 Optionally, the user can select the desired video programming after viewing indexing
2 information 238 on television 210. For example, the user might decide to view program B
3 of Figure 10. If so, the user makes the selection using remote control device 216 or any
4 other input device. VCR control module 226 then automatically advances recording
5 medium 232 to location 244b of Figure 10, where program B begins. Using this method of
6 the invention, the user is relieved of the often time-consuming task of manually searching
7 for the beginning of a video program recorded on a recording medium.

8 It should be noted that the foregoing and other novel video programming recording
9 methods cannot be practiced with the conventional daisy chain architecture of Figures 1-3.
10 In Figure 3, EPG information that may be stored at Internet terminal 12 is not accessible by
11 VCR 30, and therefore cannot be recorded by the VCR.

12 13 Interchangeable Jacks

14 As noted in reference to Figures 4 and 6-8, jacks 42 represent one example of means
15 for electrically connecting each of the plurality of consumer electronics devices to the
16 central device in a hub and spoke configuration. Furthermore, according to one
17 embodiment, jacks 42 of Figure 4 are identical and interchangeable, and can be used with
18 stereo or mono audio signals and S-video or RCA video signals. Jacks 42 can be identical in
19 the sense that they have the same pin structure.

20 As shown in Figure 11, central electronics device 40 includes sensors, other
21 hardware, and/or computer-executable instructions for determining the type of cable 310
22 connected to jack 42. Cable 310 has been connected to jack 42 as a user connects a
23 consumer electronics device to central electronics device 40. The consumer electronics
24 device may be any desired device, including those depicted in Figure 8. Cable 310 has a

1 plug 312 that connects with jack 42. Jack 42 and plug 312, according to one embodiment,
2 are a standard jack and plug pair such as those that are used in conventional portable stereo
3 equipment and headphones and in personal computer microphones.

4 When the user connects cable 310 to jack 42, cable type sensor 314 determines
5 whether the cable is an audio-video (AV) cable or an audio-only cable. For example, if
6 cable 310 is connected to a digital satellite system (DSS) receiver, cable type sensor 314
7 determines that cable 310 is an AV cable. Cable type sensor 314 then determines whether
8 the cable is an input or output cable with respect to the consumer electronics device. This
9 can be performed by determining whether there is an audio or video signal on the cable. For
10 example, if the user has connected a DSS receiver to central electronics device 40, cable
11 type sensor 314 will determine that cable 310 is an AV output cable associated with a
12 consumer electronics device.

13 When cable type sensor 314 has characterized cable 310 as AV or audio-only and as
14 an input or output cable, the cable type sensor may need additional information to identify
15 the consumer electronics device associated with cable 310. If so, central electronics device
16 40 can prompt the user to input the type of consumer electronics device. This can be done
17 by displaying a question or menu choices on a television set connected to central electronics
18 device 40. Although identifying the consumer electronics device may require some user
19 input, it does not require the user to understand whether cable 310 is AV or audio-only or
20 whether it is an input or output cable. In view of the foregoing, cable type sensor 314
21 represents one example of means for identifying the type of signals that are compatible with
22 the consumer electronics devices connected to central electronics device 40.

23 Furthermore, in some instances, cable type sensor 314 can deduce the identity of the
24 consumer electronics device connected to cable 310 using the signals carried on cable 310

1 and conductivity properties of the cable. For instance, cable type sensor 314 can determine
2 whether the cable conducts only in one direction (i.e., whether the cable includes a diode of
3 an IR blaster) or measure the impedance of the jack to determine if the cable is connected to
4 a microphone or is an audio connector.

5 Cable type sensor 314 can also determine whether the user has connected an S-video
6 cable or an RCA cable to jack 42 without the user having to understand the difference
7 between these cable types. Figure 12A illustrates a cable that is compatible with both S-
8 video and RCA video formats. Cable 410 is supplemented with an S-video-to-RCA video
9 adapter 412, illustrated in Figures 12A and 12B, that allows cable 410 to be used with
10 televisions or other consumer electronics devices having either format. Notably, plug 312 of
11 cable 410 that connects to the central electronics device 40 of Figure 11 is the same, whether
12 cable 410 is used with S-video or RCA signals. Thus, the user inserts plug 312 into any
13 desired jack 42 on central electronics device 40. When the television to be connected does
14 not have an S-video connector, or when the user desires to use the RCA video input, adapter
15 412 is coupled to the end of connector 414. Adapter 412 has a female S-video socket 416
16 that mates with the male S-video pins of connector 414. At its other end, adapter 412 has a
17 male RCA video coupler 418. When cable 410 is instead to be used with an S-video format
18 television, adapter 412 remains unconnected to connector 414. In this case, connector 414 is
19 coupled with the corresponding S-video connector of the television.

20 Cable 410 can therefore be used to connect a television or another consumer
21 electronics device to a home entertainment system without the user understanding the
22 significance of the difference between S-video and RCA connections. The user merely
23 selects a jack 42 on the central electronics device 40 and uses the adapter 412 with cable
24 410, if necessary.

1 One possible method by which cable type sensor 314 can determine whether cable
2 410 is being used with the S-video or RCA format involves sensing whether adapter 412 has
3 shorted together two of the S-video pins. If so, cable type sensor 314 concludes that cable
4 410 is being used as an RCA cable. Otherwise, cable type sensor 314 concludes that cable
5 410 is being used as an S-video cable.

6 Figure 13 illustrates representative examples of cables that can be used in
7 combination with the interchangeable jacks of the central electronics devices. Cable 500 is a
8 stereo, audio-only cable having a plug 502 compatible with the interchangeable jacks.
9 Likewise, the other cables of Figure 13 also have a plug 502 compatible with the
10 interchangeable jacks. Cable 510 is a microphone cable providing mono, audio-only output
11 from the consumer electronics device, which in this case, is microphone 512. Cable 512 is a
12 data cable providing input to IR blaster 514, which can be understood as a consumer
13 electronics device as used herein.

14 Referring now to Figure 11, when cable type sensor 314 has determined the type of
15 cable (i.e., AV/audio-only and output/input), signal format module 316 adapts any outgoing
16 signals to the proper format of the cable and the associated consumer electronics device.
17 Alternatively, signal format also uses the identity of the cable and the consumer electronics
18 device to respond to incoming signals over cable 310.

19 When central electronics device 40 is to relay signals from one consumer electronics
20 device to another, it can reformat the signals, as needed, to correspond to the particular
21 consumer electronics devices in question. For example, central electronics device 40 can
22 receive video signals in an S-video format from a cable box and transmit the signals in an
23 RCA format to a television. Thus, signal format module 316 and associated signal
24 transmission hardware represent examples of means for converting an electrical signal

1 between a first format compatible with the central device and a second format compatible
2 with one of the plurality of consumer electronic devices.

3 Thus, central electronics device 40 can be used to facilitate communication between
4 the various consumer electronics devices connected thereto. As noted herein, central
5 electronics device 40 can have Internet access capabilities, whereby Internet information can
6 be retrieved and displayed on an associated television set. In one embodiment, central
7 electronics device 40 can have dual states of functionality. In particular, central electronics
8 device 40 can be fully booted and powered to a state in which it can access the Internet.
9 Alternatively, central electronics device 40 can be powered to a lower state of functionality,
10 wherein it cannot access the Internet but can still route electrical signals between consumer
11 electronics devices. This lower state can be useful to quickly activate central electronics
12 device 40 when full Internet functions are not needed.

13 The present invention may be embodied in other specific forms without departing
14 from its spirit or essential characteristics. The described embodiments are to be considered
15 in all respects only as illustrative and not restrictive. The scope of the invention is,
16 therefore, indicated by the appended claims rather than by the foregoing description. All
17 changes which come within the meaning and range of equivalency of the claims are to be
18 embraced within their scope.

19 What is claimed and desired to be secured by United States Letters Patent is:
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